terms. Energy is now cheaper, in real terms, than it was in 1974. The break-up of the Soviet Union, the return of South Africa to the world community, and the rise of market economies in the Third World are all making easier the access by explorer/developers to world-class minerals deposits outside resource-rich Australia.

Productivity in our resource industries is generally at a world-class level. To the extent our commodity exports can't compete at times of low prices, the reasons often relate to market distortions outside our control—export subsidies by our competitors, and consumer subsidies—or various tariff and non-tariff import restrictions—by our potential customers.

Ours is still a good country in which to live. Compelling evidence of this fact is that people want to come here and share our culture, our form of government, and of course our wage-levels and social services. Some have risked their lives to get here.

However, Australia is not paying its way in the world.

Our current account deficit continues to grow at an alarming rate (by 6% of GDP in 1994–95) and, despite patently living beyond our means, we still cannot provide sufficient jobs for those who want to work.

Australia is being out-competed in this competitive world.

We clearly have long-term problems as a nation, and long-term solutions are needed.

Our commodity industries provide wealth rather than jobs. If we are to repair our balance of payments position, and if we are to provide intellectually and economically rewarding jobs in sufficient quantity to meet the needs of our children and our immigrants, we must look to other sectors of the economy—manufacturing and services.

Long-term productivity growth in the non-commodity sectors of Australia's economy is below 2% p.a. This is far too low if Australia is to pay its way *vis a vis* the rest of the world, and if it is to protect and enhance its exceptional quality of life. Gone are the days when the sheep's back will carry us.

Obviously there is no quick, easy, or even single, solution to problems which have been creeping up on us for decades. However, productivity is certainly part of the equation. Whether in terms of turning around our widening trade deficit in manufactured goods, or of lifting our foreign earnings from the services sector, science and technology can and must play an increasing role in accelerating Australia's productivity growth, and hence improving our international competitiveness.

There is more to it than just asserting that the Federal Government 'should' provide more money for research at this time of increasing budget stringency; or that industry 'should' transfer a larger share of profits from potential dividends to its R&D budgets; or that more of the top students 'should' choose science or engineering rather than medicine or law.

As Victoria's oldest learned society, the Royal Society of Victoria decided to stimulate thinking among opinion-formers in the community about what must be done. Our field is science, and we decided to make our contribution by assembling the outstanding leaders on science policy for this Symposium.

Unless one is assured of perpetual youth—and infinite wealth—life becomes a series of workable compromises. Your Society found it no less so with this Symposium.

In order to attract the best brains in the Victorian community as an audience, it was crucial that we won acceptances from the speakers whom we felt really could make an authoritative and worthwhile contribution to our topic. As you can see from the program, we got our speakers—but at a price. As you might expect, those we invited to speak were busy people with great demands on their time. We felt unable to insist that their acceptance required the submission of any written material, before or after the Symposium.

This is the reason that these Transactions contain an introduction, three fully-written-out papers, one full paper in note form and one summary. No written material is available from the other two speakers, and the event was not tape-recorded. In our opinion, the remaining talks (two of the more trenchant addresses) were sufficiently important that a lasting record was demanded. They are each represented here by an 'impression' written by one who heard the talks. This is a compromise between our desired objective of publishing the speakers' own written record, and the alternative of providing nothing.

PROFESSOR JOHN M. SWAN FAA

OPENING REMARKS

Why is science policy important? Let me give you two quotations, both from the 17th Century.

> 'He that will not apply new remedies must expect new evils.'
>
> *Francis Bacon*

The most valuable new remedies, in my opinion, will be those based on scientific investigation and

scientific understanding. Our science policies are important because they will dictate our strategies, our action plans for the necessary scientific research.

> 'Where there is much to learn, there of necessity will be much argument, much writing, many opinions; for opinion in good men is but knowledge in the making.' *John Milton*

At this meeting we shall hear opinion from good men and good women. And let us remember that even if the opinions are diverse, all of us are trying, from different perspectives, to put in place the most useful and productive science policies for our countries.

Can I suggest, as a basis for this meeting, that good science policies are our lifeline to the future.

Let me give two examples of the importance of science policies. The world population continues to expand; human numbers now challenge the ecological sustainability of the planet. 'Farming in the future' (and I quote from Derek Tribe's recent book *Feeding and Greening the World*) 'must aim to increase productivity while minimising the use of scarce resources such as fossil fuel energy, water, capital and land, maximising the use of plentiful resources such as human labour, solar energy, genetic biodiversity and expanding knowledge, and avoiding the contamination, degradation or destruction of the natural environment'.

Good husbandry on the farm within these constraints, will require more and better scientific understanding of plants and animals, soil, water, nutrients, plant and animal health, the harvesting and transport of crops, down-stream processing, food preservation, marketing.

Effective science policies to ensure that the necessary work is done are essential for achieving this goal of increased agricultural production.

Without good science policies, who will ensure that the required scientists and their scientific knowledge are available to the farmer when needed?

My second example is simply a list, but an astonishingly wide list, of the sciences which are critical to the modern food processing industries. These are:

Biopolymer science;
Bio-organic chemistry;
Crystallisation;
Failure mechanics;
Preservation;
Plant cell technology;
Process engineering;
Rheology;
Colloid science;
Nutrition;
Microbial cell biology;
Fluid dynamics;
Molecular modelling; and
Heat and mass transfer modelling.

The food industry will never compete internationally unless all these sciences and technologies are kept alive and well through good science policies which recognise their importance.

Good science policies really are our lifeline to the future.

Where do the scientists themselves fit in? Scientists often expect:

- a high degree of freedom from bureaucratic regulation and interference;
- open communication via international publication;
- close cooperation between institutions and individuals;

and many scientists also request and sometimes demand,

- a major role in determining the direction of their own research.

The tensions between the autonomy of the research scientist and the degree to which programs can or should be formulated by end users, or influenced by the political process, seem to lie at the heart of much that has been happening in science policy in Australia and New Zealand in recent years. I expect that the papers in this afternoon's session will address these and related issues, and now call on our speakers to take the floor.

Sir Arvi Parbo ac fts

SCIENCE AND TECHNOLOGY AND AUSTRALIA'S FUTURE

I am delighted to be invited to participate in this Symposium on Science Policy and I warmly commend the Royal Society of Victoria for organising it. You have assembled a very distinguished group of speakers and I am honoured to have been included.

The Royal Society of Victoria has an impressive record in promoting the advancement of science and its application for the benefit of the people of Victoria. I am pleased to be a member and to have been associated with some of the activities of the Society and the former Sciences Club over the years. Indeed, as I recall, Professor Adrienne